Mr. Woods and Dr. Morley Davies are, as instructors of youth, chiefly concerned to get some facts into the heads of their pupils. They have not much space for philosophic discussion (what they have they make good use of), and none at all for that general talk which can brighten the way or inspire the reader to further effort. Whichever of them you choose to follow as guide, you will be well advised to take Mr. Hawkins with you as philosopher and friend. His drawings and photographs are admirable, and, considering the price of the book, are as much a credit to the publisher as to his own skill. They will greatly help the reader who has not at hand the more purely descriptive works, or whose acquaintance with fossils is not already that which seems demanded by some of the chapters. The chapter on materials explains the nature of fossils and distinguishes the various modes of preservation and their relation to different kinds of rocks. Thus it answers questions constantly asked by the casual finder of fossils. Is it, however, quite true that amber inclusa represent "the most perfect type of preservation"? Were this so, it should be possible to dissolve out the organisms and to remount them in a manner more convenient for study. He who attempts this will find that there is nothing to get out. What one sees in the amber is but an imprint—the ghost, as it were, of some insect, the material body of which has vanished. The preservation of chitin in some fine clays, as of the Oesel Eurypterus, is really more complete.

Again, to apply the term "cast" to an external imprint, and the term "mould" to an internal filling of some dissolved shell, seems to reverse the ordinary usage. Here Dr. Davies and Mr. Woods more nearly approach accuracy. There are four cases to distinguish: a single valve of a mussel may leave in the rock an external imprint or impression, and an internal imprint; the complete shell of a mussel or a snail, or the test of a sea-urchin, may have been dissolved away, leaving the complete external mould (from which a plaster cast can be taken) and the complete infilling of matrix (which is a natural cast of the interior).

The geological distribution and the succession of life-forms, which constitute the real basis of palæontology as an independent science, are attended to by Mr. Woods in paragraphs under the zoological divisions, and are summarised by Dr. Davies in a compact but clear appendix. Under the heading "Historical Biology" they make up the second half of Mr. Hawkins's book. Anyone who has attempted a similar history knows how hard it is to vary the phrasing, to bring out the broad masses, and to avoid a mere list of names. "Lucina and Corbis are common throughout the era. Cyclodonts are abundantly illustrated by Cardiidæ, Protocardia and Discors are especially frequent in the Eocene, Cardium itself is common in the Crags. Teleodonts are the predominant forms. Venus (pl. xvi., Fig. 1), Dosinia (pl. xvi., Fig. 2), Meretrix and Paphia have numerous species in the later Cainozoic; Tellina, Macoma, Psammobia and——" but, no! the pen denies its office. Let us rather turn back to the interesting chapters "Geological Palæontology" and "Biological Palæontology," where the author shows what light may be thrown by fossils on climatic and other conditions at diverse times and places, and on the problems of phylogeny, morphogeny, specialisation, degeneration, and orthogenesis.

The profound studies of Echinoidea by Mr. Hawkins entitle his opinions on those difficult questions to the utmost respect. But, dealing as we are here with educational books, we prefer to conclude with an opinion based on his successful work as teacher, an opinion with which examiners ought to agree. Recognition of species (fossil-spotting) should not be demanded of average students. "The chronological distribution of families and genera will give ample precision for elementary needs." "The most elementary student ought to know that Ammonites are not found in Cainozoic rocks; but he ought *not* to know the difference between *Dactylioceras commune* and *Peronoceras annulatum.* If the latter detail has been forced into his unprepared mind, some point of more general application and greater importance must have been omitted or ejected."

F. A. Bather.

Sugar Technology and Fermentation.

(1) *The Sugar-beet in America.* By Prof. F. S. Harris. (The Rural Science Series, edited by L. H. Bailey.) Pp. xviii + 342 + xxxii plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1919.) Price 12*s.* net.

(2) *The Manufacture of Sugar from the Cane and Beet.* By T. H. P. Heriot. (Monographs on Industrial Chemistry, edited by Sir Edward Thorpe.) Pp. x + 426. (London: Longmans, Green, and Co., 1920.) Price 24*s.* net.

(3) *The Carbohydrates and Alcohol.* By Dr. S. Rideal and Associates. (Industrial Chemistry.) Pp. xv + 219. (London: Baillière, Tindall, and Cox, 1920.) Price 12*s.* 6*d.* net.

(1) THE beet-sugar industry in North America is of comparatively recent date, although it was undertaken nearly a century ago by men,

as the author remarks, "who had more enthusiasm than knowledge." It may now be said to be firmly established, thanks largely to the magnificent work carried out in the experimental stations of the United States Department of Agriculture. Prof. Harris has produced a compact and useful treatise on a subject which is of the greatest interest to us in the United Kingdom, and also to those in other parts of the Empire where the beetroot might be cultivated. The manufacture of sugar from beet presents numerous difficulties, and all who are interested in the subject would do well to study the present little volume. The text is clearly written, and the information it gives is concise and complete. A valuable feature is the list of books, periodicals, bulletins, and reports, in the English language, which is appended.

(2) Most teachers of specific branches of science prefer to write a book for the guidance of students in which the subject-matter is arranged in that particular manner and sequence to which they give preference. The book before us is one of that class. It is written by a sugar expert for the guidance of his students. We believe that Mr. Heriot is the only lecturer in Great Britain on sugar technology—a subject of such vast importance to the British Empire. The reviewer is the chairman of the Empire Sugar Supply (Technical) Committee, which issued a preliminary report in July, 1919. Information had been obtained from the Dominions, Dependencies, Colonies, and Protectorates of the Empire showing to date the production and consumption of sugar in the Empire, and the possibilities of increasing the production to such an extent as to render the Empire self-supporting as regards this commodity were considered. The report has been sent to members of the Government and to numerous other Members of Parliament and high officials. Up to the present, however, the only movement on the part of the Government has been the appointment of a committee of experts to visit India and report on the possibilities of extending sugar production in that part of the Empire.

The appearance of Mr. Heriot's book is a welcome sign that the teaching of sugar technology within the United Kingdom is now progressing. The problem of Empire sugar needs a sufficiency of trained scientific experts, for the industry is no longer one that can be left in the hands of rule-of-thumb workers. Its principles require a knowledge of agriculture, botany, chemistry, and engineering, which can only be gained at an institution such as that with which Mr. Heriot is connected.

The text of the book is divided into ten parts, covering well the whole field included under the title, whilst the numerous illustrations add much to its value. The first five chapters, dealing with scientific principles, cover but thirty-two pages, and they should certainly be extended in future editions. They are, by reason of their brevity, dogmatic rather than educational, and as an instance the opening chapter on the formation of sugar by plants may be cited. Nothing is said of plant respiration, whilst in the converse phenomenon, photosynthesis, formaldehyde is given as the first product. It is stated, without authority, that formaldehyde has been detected in minute quantities in the leaves of plants, but reference should have been made to a paper by Jörgensen and Kidd in 1917 in which it is shown that formaldehyde arises from chlorophyll in the absence of carbon dioxide.

Although a detailed description of analytical methods would be out of place in the present volume, chap. xv., covering twelve pages, is meagre—so much so as to make it of no value whatever. Under "reducing sugars," for example, the following may be quoted from the text: "A measured volume of Barreswill's (Fehling's) solution is diluted with water and boiled. The juice is then gradually added until the whole of the copper is precipitated as cuprous oxide. From the volume of the juice thus added, the reducing sugars per 100 of juice can be calculated."

The main portion of the book is devoted to technology, and here the matter is well chosen. Mr. Heriot has certainly added a useful volume to the literature of sugar manufacture, and one which was needed in our Empire, since it embraces the manufacture of sugar from both cane and beet.

(3) This book is one of a series the object of which is to give a "general survey" of industries "showing how chemical principles have been applied and have affected manufacture." "The subject," says the editor, "will be treated from the chemical rather than the engineering standpoint." The impossibility of giving more than an outline of the subject is admitted, but it is hoped to stimulate greater interest in certain industries to which the nation has paid insufficient attention.

Commencing with an introduction of fifteen pages dealing generally with the carbohydrates, cellulose, starch and its hydrolytic products, and the sugars, the remainder of the text is divided into six parts, each subdivided into sections. It deals with starch, dextrin, glucose, maltose, cane-sugar, beet-sugar, sugar refining, minor sources of sugar, caramel, malting, brewing, wine, potable and industrial alcohol, vinegar, acetic acid, acetone, and glycerin.

The task of writing such a book as that before us is no easy one, needing, as it does, the securing of collaborators having both practical and scientific knowledge of the various industries. Whilst it is not for us to criticise the qualifications of Dr. Rideal's collaborators, our reading of the book has led us to the conclusion that it is a condensed account of existing treatises rather than a succinct and original outline of the various chemical industries. References to the literature are given at the end of each part, and these, we submit, would have been better included in the text, so that the reader would know exactly where to find an expansion of any specific phase of the subject. References to journals such as that of the Society of Chemical Industry, without indicating definite papers, are of little use to those who are not specialists, but wish to glean further information on specific points.

The major portion calls for little comment on the score of accuracy, but there are some errors and mis-statements, and among them the following may be cited. Wheat is said in one place to contain 55–65 per cent. of starch, whilst in another place the average starch content is stated to be 68 per cent. The statement that the cheapest form of starch is that derived from the potato is inaccurate, and we can scarcely agree that wheat starch is used as a paste for bill-posting, etc.! The title "Cane Sugar" and "Beet Sugar" for the sections dealing with the manufacture of sugar from cane and beet respectively might tend to revive the fallacy that sugar from the two sources differs. Goldthorpe barley is a broad-eared, not a narrow-eared, two-rowed barley; it belongs to the variety *Hordeum zeocriton,* not to *Hordeum distichum.* The statement that by the malting process "the insoluble starch of the grain is converted into soluble fermentable sugar" is one long ago exploded.

As a general criticism of this book, we regret being unable to come to any other conclusion than that the editor has failed to achieve his object. We hope that in the near future, with the collaboration of his expert advisers, he will recast the volume so as to eliminate errors and to give a clear and concise outline of the chemical industries dealt with. ARTHUR R. LING.

Our Bookshelf

Magic in Names and in Other Things. By E. Clodd. Pp. vii + 238. (London: Chapman and Hall, Ltd., 1920.) Price 12*s.* 6*d.* net.

DEALING with the question of magic in names, Mr. Clodd expounds with interesting detail a chapter in folk-lore familiar to serious students, but well deserving treatment in a more popular form. His book is, in the main, a study of magic, or, to use the new word, "mana," "the sense of a vague, impersonal, ever-acting, universally diffused power" immanent in all things. His special subject, the name, is well defined in a quotation from Mr. Cornford which appears on his title-page: "Language, that stupendous product of the collective mind, is a duplicate, a shadow-soul, of the whole structure of reality; it is the most effective and comprehensive tool of human power, for nothing, whether human or superhuman, is beyond its reach." Hence the preliminary discussion of the mana in a man's hair or spittle, through which the magician can work evil against the owner, merges into a detailed consideration of the name. Evil can be worked against you by anyone who knows your name, and hence it is wise to have two names, one concealed, one for daily use. This leads to the more serious name of power, curses and charms, passwords and spells, the "mantram" of the Hindu, by means of which even the gods themselves can be coerced. The Mohammedan knows the Ninety-and-Nine Names of Allah, and by repeating them over and over again for days he gains magical power. This exposition, always clear and impressive, even if at times the religious views of the author are disclosed with undue emphasis, is supported by an accumulation of interesting facts drawn from a wide range of study of the thought of primitive peoples and of popular belief throughout the world. Folk-lore, as an expression of primitive psychology, has too long remained the possession of the expert, and any attempt to popularise it is welcome. This is Mr. Clodd's achievement, and his exposition of this chapter of popular belief proves the value of the study as a key to unlock the mind of man, which no historian or sociologist in the future can safely neglect.

The Civil Servant and his Profession. Pp. viii + 124. (London: Sir Isaac Pitman and Sons, Ltd., n.d.) Price 3*s.* 6*d.* net.

THE Society of Civil Servants has organised a series of lectures on various aspects of the profession, and the book under notice contains five of the lectures which were given in March last, with an introductory address by Sir Cecil Harcourt Smith. The first lecture, by the late Sir Robert Morant, deals with the administrative side of the Civil Servant's profession; the second, by Lord Haldane, with the legal aspects; the third, by Sir Sidney Harmer, is on the subject of national museums and scientific research; the fourth, by Mr. E. F. Wise, treats of the relationship between the Civil Service and industry; and the last, by Mr. J. Lee, deals with the psychology of the Civil Servant. This collection of lectures will give the public some idea of the diversity, importance, and highly technical nature of the work which is performed by the staff of men and women who constitute the Civil Service.